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**The Effects of Anthropogenic Food on the Body  
Condition, Biochemistry, Stable Isotopes and Egg  
Quality of Silver Gulls in Tasmania**

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Submitted in fulfilment of the requirements for the Degree of

Doctor of Philosophy

School of Zoology, University of Tasmania

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### **Declaration**

This thesis contains no material which has been accepted for a degree or diploma by the University of Tasmania or any other institution, and to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due acknowledgement is made in the text of this thesis.

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## Abstract

Many studies worldwide have attested to an increase in gull populations following urbanisation, and it is widely presumed that gulls have benefited as a direct consequence. However, foraging at tips and food outlets may induce a health cost in urbanised birds and the benefits of eating anthropogenic food should be questioned; the physiological health effects of ‘garbivory’ on wild birds are yet to be tested. This study was based on the premise that a negative effect on the health and hence fitness of gulls was expected from eating the equivalent of human ‘junk food’.

This research investigated the potential adverse effects of an anthropogenic diet on the health of Silver Gulls (*Larus novaehollandiae*) by comparing birds breeding at a remote, non-urbanised site (Furneaux Island Group, Bass Strait) with those at an urbanised (Hobart) colony in Tasmania, Australia. A variety of approaches were used to assess the health of this species to gain a more comprehensive evaluation. Mass and body condition (measured by an index), stable isotopes in whole blood ( $^{13}\text{C}/^{12}\text{C}$  and  $^{15}\text{N}/^{14}\text{N}$ ), blood biochemistry (HDL- and total cholesterol, triglycerides, glucose, calcium, sodium, potassium and corticosterone), and egg quality (physical measurements and mass, absolute and proportional chemistries, shell thickness, yolk colour and historic comparisons) were compared between the two gull populations.

Urbanised gulls were heavier and had greater body condition than structurally identical non-urbanised gulls. Analyses of stable isotopes in whole blood suggested that remote, non-urbanised gulls tended to eat from a more marine origin, while urbanised gulls fed from a different food web and from a more freshwater/terrestrial origin. Assessment of

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regurgitations suggested that although specific dietary items were generally either human-derived or natural, some overlap existed between sites. The urbanised gulls had higher levels of HDL-cholesterol in their blood. Clutch sizes did not differ, but eggs from the Furneaux Island Group were larger, heavier and had greater yolk mass than those from Hobart, as well as greater carotenoid concentrations in the yolk. Although urbanised Silver Gulls were apparently successful in laying eggs, poorer reproductive success may have resulted from smaller, lighter eggs that contain proportionally less yolk reserves. Overall, the Silver Gull provided a very good model to study the effects of urbanisation on a native species and numerous opportunities exist to focus future research in this area.

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Most good students have a small army of silent supporters whose generosity and patience often goes unheralded. It's not possible to give each supporter detailed appreciation in a few pages, but I do hope that this method will convey my gratitude.

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## **Preface**

This doctoral dissertation is composed of a general introduction (Chapter 1), general methodology (Chapter 2), and four experimental chapters (Chapters 3, 4, 5, 6). Three of these have been submitted as manuscripts to peer-reviewed journals and one was written as a chapter. The general discussion (Chapter 7) includes a summary of all results, comparisons to other synanthropic larids, population trends and management implications. Finally, a list of presentations arising from this research is given in Appendix I and a list of media coverage is given in Appendix II. The author, Heidi J Auman, has written all of these chapters and performed all statistical analyses. Supervisors Alastair Richardson and Catherine Meathrel have provided advice and editing throughout, and are therefore listed as co-authors in the chapters written as manuscripts for publication.

The experimental chapters submitted to/accepted in journals have been reformatted to fit the guidelines for this dissertation, but the complete title pages, keywords and acknowledgements were not included. Australian English and spelling remain in the chapters submitted as manuscripts to American journals. All figures and tables for each chapter were placed before the bibliographies to retain the flow of text. Some overlap of material appears, especially in the introductions, as each data chapter was written as a stand-alone paper. The four experimental chapters are:

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**CHAPTER 3. Urbanisation of Silver Gulls: evidence of anthropogenic diet from stable isotope analyses.** Heidi J Auman, Catherine E Meathrel and Alastair

Richardson. 2007. Submitted to Condor.

**CHAPTER 4. Supersize me: does anthropogenic food change the body condition of Silver Gulls? A comparison between urbanised and remote, non-urbanised**

**areas.** Heidi J Auman, Catherine E Meathrel and Alastair Richardson. 2007.

Accepted in Waterbirds.

**CHAPTER 5. Blood biochemistry of Silver Gulls in urbanised and remote**

**colonies of Tasmania.** Heidi J Auman, Catherine E Meathrel and Alastair Richardson.

2007. Accepted in Emu (Austral Ornithology).

**CHAPTER 6. Comparison of egg quality in Silver Gulls feeding from**

**anthropogenic versus natural food sources.** (to be submitted at a later date as at least two manuscripts)

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## TABLE OF CONTENTS

<b>Title Page</b>	<i>i</i>
<b>Declaration</b>	<i>ii</i>
<b>Abstract</b>	<i>iii</i>
<b>Acknowledgements</b>	<i>v</i>
<b>Preface</b>	<i>ix</i>
<b>Table of Contents</b>	<i>xi</i>
<b>List of Figures and Tables</b>	<i>xv</i>
<b>CHAPTER 1: General Introduction</b>	<b>1</b>
1.1 Background	2
1.2 Organization of Thesis	6
1.3 References	10
<b>CHAPTER 2: General Methodology</b>	<b>16</b>
2.1 Introduction	17
2.2 Description of Sites	17
2.2.1 Furneaux Island Group	18
2.2.2 Hobart	19
2.3 Time Frames	19
2.4 Site Tenacity During Breeding Season	20
2.5 Field Work	20
2.5.1 Transect Line	21
2.5.2 Trapping Techniques	21
2.5.3 Trapping Effort per Bird	22
2.5.4 Morphometric Measurements	23
2.5.5 Banding	24
2.5.6 Blood Sampling	24
2.5.7 Egg Collection	25
2.5.8 Regurgitant Collection	25

---

2.6 Laboratory Work	26
2.6.1 Blood Aliquots	26
2.6.1.1 Biochemical Analyses	26
2.6.1.2 Stable Isotope Analyses	27
2.6.3 Egg Analyses	28
2.6.3.1 Physical Measurements	28
2.6.3.2 Chemical Measurements	28
2.6.3.3 Yolk Colour	29
2.7 Statistical Analyses	29
2.8 References	34
<b>CHAPTER 3: Urbanisation of Silver Gulls: evidence of anthropogenic</b>	<b>37</b>
<b>diet from stable isotope analyses</b>	
3.1 Abstract	38
3.2 Introduction	38
3.3 Methods	41
3.3.1 Site Selection and Sample Collection	41
3.3.2 Conventional Dietary Assessment	42
3.3.3 Isotope Selection and Analyses	43
3.3.4 Statistical Analyses	44
3.4 Results	44
3.4.1 Isotopic Signatures	44
3.4.2 Regurgitants	45
3.5 Discussion	46
3.6 References	55
<b>CHAPTER 4: Supersize me: does anthropogenic food change the body</b>	<b>61</b>
<b>condition of Silver Gulls? A comparison between urbanised and remote,</b>	
<b>non-urbanised areas</b>	
4.1 Abstract	62
4.2 Introduction	62
4.3 Methods	65

---

4.4 Results	67
4.4.1 Comparisons of Mass and Body Condition over Time	67
4.4.2 Comparisons Across Geographical Locations	68
4.4.3 Comparisons by Breeding Status	69
4.4.4 Comparisons by Gender	69
4.4.5 Comparisons of Urban and Remote, Non-urban Locations	70
4.5 Discussion	71
4.6 References	82
<b>CHAPTER 5: Comparison of blood biochemistry between urbanised and remote Silver Gulls in Tasmania</b>	<b>88</b>
5.1 Abstract	89
5.2 Introduction	89
5.3 Methods and Materials	91
5.4 Results	96
5.5 Discussion	98
5.6 References	107
<b>CHAPTER 6: Comparison of egg quality in Silver Gulls feeding from anthropogenic versus natural food sources</b>	<b>115</b>
6.1 Abstract	116
6.2 Introduction	117
6.3 Methods and Materials	120
6.3.1 Egg Collections	120
6.3.2 Laboratory Methods	121
6.3.3 Chemical Analysis	122
6.3.4 Yolk Colour Analysis	122
6.3.5 Historical Comparisons	122
6.3.6 Statistical Analysis	123
6.4 Results	124
6.4.1 Comparison of Laying Dates	124
6.4.2 Comparison of Clutch Sizes	124
6.4.3 Comparison of Egg Physical Parameters	126

---

6.4.4	Comparison of Egg Composition – Absolute	128
6.4.5	Comparison of Egg Composition – Proportional	130
6.4.6	Comparison of Yolk Colour	133
6.4.7	Comparison of Historic and Contemporary Collections	134
6.5	Discussion	134
6.5.1	Laying Date	134
6.5.2	Clutch Sizes	135
6.5.3	Physical Size	136
6.5.4	Absolute Chemistry	138
6.5.5	Proportional Chemistry	140
6.5.6	Carotenoids	141
6.5.7	Historic Comparisons	144
6.6	Conclusions	145
6.7	References	191
<b>CHAPTER 7: General Discussion</b>		<b>199</b>
7.1	Summary of Major Results	200
7.2	Comparisons to Other Synanthropic Larids	204
7.3	Silver Gull Populations	205
7.4	Policy and Management Implications	207
7.5	References	212
<b>Appendix I: List of presentations during candidature</b>		<b>217</b>
<b>Appendix II: List of media coverage during candidature</b>		<b>218</b>

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## List of Tables

Table 3.1. Comparison of carbon and nitrogen stable isotopes in the blood of Silver Gulls from Hobart and the Furneaux Island Group in 2004.	52
Table 4.1. Comparison of mass, head length, keel length and body condition, separately by gender, for Silver Gulls nesting in Hobart and Perth.	78
Table 4.2. Comparison between the stages of breeding of mass, head length, keel length and body condition index, separately by gender, for Silver Gulls nesting in Hobart in 2004.	79
Table 4.3. Comparison between the stages of breeding of mass, head length, keel length and body condition index, separately by gender, for Silver Gulls in the Furneaux Island Group in 2004.	80
Table 4.4. Comparison between the mass, head length, keel length and body condition index, separately by gender, for Silver Gulls nesting in the Hobart and Furneaux Island Group in 2004.	81
Table 5.1. Reference values for various blood biochemical parameters in Silver Gulls from Hobart and the Furneaux Island Group combined.	104
Table 5.2. Principal Component Analysis of eight blood variables in Silver Gulls from the Furneaux Island Group and Hobart.	105
Table 6.1. Clutch size, egg length, width, mass and volume for Tasmanian Silver Gulls in 2005.	150
Table 6.2. Clutch size, egg size, volume and fresh mass of all Silver Gull eggs collected from Hobart and the Furneaux Island Group in 2005.	152
Table 6.3. Differences in egg size, mass and volume in one-egg clutches from Hobart and the Furneaux Island Group in 2005.	154
Table 6.4. Differences in egg size, volume and mass in two-egg clutches from Hobart and the Furneaux Island Group in 2005.	155
Table 6.5. Differences in egg size, volume and mass in three-egg clutches from Hobart and the Furneaux Island Group in 2005.	156
Table 6.6. Egg size, volume and fresh mass, separately by a- and b-eggs in different clutch sizes laid by Silver Gulls in Hobart and the Furneaux Island Group combined.	158
Table 6.7. Egg size, mass, volume and fresh mass, separately by a- and b-eggs in different clutch sizes laid by Silver Gulls in Hobart only.	159

---

Table 6.8. Egg size, mass, volume and fresh mass, separately by a- and b-eggs in different clutch sizes laid by Silver Gulls in the Furneaux Island Group only.	160
Table 6.9. The mean absolute composition of freshly laid eggs from completed, one-egg clutches of Silver Gulls nesting in Hobart and the Furneaux Island Group in 2005.	161
Table 6.10. The mean absolute composition of freshly laid eggs from completed, two-egg clutches (a + b combined) of Silver Gulls nesting in Hobart and the Furneaux Island Group in 2005.	162
Table 6.11. The mean absolute composition of freshly laid eggs from completed, three-egg clutches (a + b + c combined) of Silver Gulls nesting in Hobart and the Furneaux Island Group in 2005.	163
Table 6.12. Differences absolute chemistries in a- and b-eggs in two-egg clutches from Hobart and Furneaux Island Group Silver Gulls.	164
Table 6.13. Differences in absolute chemistries in a-, b- and c-eggs in three-egg clutches from Hobart and Furneaux Group Silver Gulls.	167
Table 6.14. The mean proportional composition of freshly laid eggs from completed one-egg clutches of Silver Gulls nesting in Hobart and the Furneaux Island Group in 2005.	170
Table 6.15. The mean proportional composition of freshly laid eggs from completed two-egg clutches (a + b combined) of Silver Gulls nesting in Hobart and the Furneaux Island Group in 2005.	171
Table 6.16. The mean proportional composition of freshly laid eggs from completed three-egg clutches (a + b + c combined) of Silver Gulls nesting in Hobart and the Furneaux Island Group in 2005.	172
Table 6.17. Differences in proportional chemistries in a- and b-eggs in two-egg clutches in Silver Gulls from the Hobart and Furneaux Island Group.	173
Table 6.18. Differences in proportional chemistries in a-, b- and c-eggs in three-egg clutches in Silver Gulls from Hobart and Furneaux Island Group.	175
Table 6.19. Comparison of absolute and proportional chemistries in Silver Gull eggs from Hobart and the Furneaux Island Group, Tasmania (2005), and Penguin Island, Western Australia (1989).	178
Table 6.20. Regressions of log-transformed egg constituent mass on the fresh mass of all eggs combined in Silver Gulls from Hobart.	181



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Table 6.21. Regressions of egg constituents on the fresh mass of all eggs combined in Silver Gulls from the Furneaux Island Group.	182
Table 6.22. Regressions of egg constituents on the fresh mass of all eggs combined in Silver Gulls from Penguin Island, Western Australia (1989).	183
Table 6.23. Comparison of yolk colour, based on a Roche Yolk Colour Fan, by egg sequence, separated by location.	185
Table 6.24. Pearson correlations between egg chemistries and yolk colour in Silver Gulls from Hobart and Furneaux Island Group.	186
Table 6.25. Physical measurements of 30 Silver Gull eggs taken from various colonies around Australia pre-dating extensive urbanisation.	187
Table 6.26. Mean physical measurements of historic Silver Gull eggs taken from various colonies around Australia compared to contemporary Silver Gull eggs from Hobart.	190
Table 7.1. Documented increases (+) and decreases (-) in various parameters in synanthropic larid species in response to diet.	209

## **List of Figures**

Figure 2.1. The location of Silver Gull sampling sites in 2004-2005.	30
Figure 2.2. Nobby's Rocks off Killiecrankie, Furneaux Island Group in Bass Strait, Tasmania, Australia.	31
Figure 2.3. The Queen's Domain colony in Hobart, Tasmania, Australia.	32
Figure 2.4. Soxhlet apparatus used for extracting egg yolk lipid.	
Figure 3.1. Location of colonies used to study the effects of anthropogenic food on the stable isotopes of blood in Silver Gulls in 2004.	51
Figure 3.2. Distribution of stable carbon and nitrogen isotope signatures in Silver Gulls from Hobart and the Furneaux Island Group.	53
Figure 3.3. Mean isotopic signatures in Silver Gulls from Hobart and Furneaux Island Group compared to isotopic signatures of common dietary groups.	54
Figure 4.1. Location of colonies used to study the effects of anthropogenic food on the mass and body condition of Silver Gulls in 2004.	75

---

Figure 4.2. Change in the body mass of Silver Gulls in Hobart over time, separately by gender.	76
Figure 4.3. Change in the body condition indices of Silver Gulls in Hobart over time, separately by gender.	77
Figure 5.1. Location of colonies used to study the effects of anthropogenic food on the blood biochemistry of Silver Gulls in 2004.	103
Figure 5.2. Principal Components Axis 1 plotted against PCA 2.	106
Figure 6.1. Location of colonies used to study the effects of anthropogenic food on the eggs of Silver Gulls in 2005.	149
Figure 6.2. Clutch sizes, given as percentages, for Hobart and Furneaux Island Group Silver Gull colonies in 2005.	151
Figure 6.3. Comparison of fresh egg masses from Hobart, Furneaux Island Group and Penguin Island, separated by sequence.	153
Figure 6.4. Yolk colour in Silver Gull eggs from Tasmania in 2005.	184

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*We have not succeeded in answering all of your problems.  
The answers we have found only serve to raise a whole set  
of new questions. In some ways we feel we are as confused  
as ever, but we believe we are confused on a higher level  
and about more important things.*

*~Anonymous*